NOTES

Blister Rust of Pinus longifolia Roxb. — Blister rust diseases of pines rank among the most important of tree diseases. They are known on both hard and soft pines throughout the northern hemisphere. Most are caused by heteroecious rust fungi and with few exceptions the causal organisms are incapable of passing directly from pine to pine. Several have received considerable study, but comparatively little is known about the majority of them. The most exhaustive investigations have been made on the highly destructive blister rust of 5-needled pines caused by *Cronartium ribicola* Kleb., and for its control eradication of *Ribes* has been thoroughly demonstrated as an effective measure. There now comes from the pen of Dr. K. Bagchee, Mycologist of the Forest Research Institute at Dehra Dun, India, the second part of an account[1] of comprehensive researches carried out by him on a hitherto little-known blister rust of "chir," a 3-needled pine (*Pinus longifolia* Roxb.), which is destructively prevalent in some of the forests of northern India, particularly in the pine forests of the Kumaon and Garwhal Himalayas. Dr. Bagchee's paper is reviewed below and to the review is added a brief comment on the nomenclature applied to the causal fungus. The quotations cited are from that paper unless otherwise indicated.

Pinus longifolia is regarded as "one of the most important forest trees in the Himalaya." Its wood is employed for ordinary furniture, general carpentry, heavy timber of all sorts, railway ties, resin production, and to some extent as fuel. "This pine is also of considerable importance as a park, garden, avenue and ornamental tree."

Barclay appears to have been the first to make mention of the fungus on chir that causes blister rust. In the opening paragraph of his description of *Aecidium complanatum* nov. sp. on *Pinus longifolia* Roxb. Barclay commented, "I have only once seen it on the stem (var. *corticola*) and my further remarks refer only to the variety on the needles." (BARCLAY, A. A descriptive list of the Uredineae occurring in the neighborhood of Simla [Western Himalayas]. Pt. III. Jour. Asiatic Soc. Bengal, **59**:101. 1890.) Reports of death of young chir trees, causes undetermined, began to issue in 1891; but it was not

[1]BAGCHEE, K. Investigations on the infestation of Peridermium himalayense Bagchee on Pinus longifolia. Part II. Cronartium himalayense, n. sp., on Swertia spp. Distribution, morphology of the parasite, pathological study of the infection, biological relationship with the pine rust, and control. (Indian Forest Records, **18**:1-66, front., pl. 1-17. 1933.)

until 1915 that blister rust "was definitely recorded as apparently doing much damage." According to Dr. Bagchee the causal fungus is seemingly native to the inner valleys of the Himalayas, and he believes that it later spread to the outer ranges. Earlier accounts referred to above, indicated sporadic outbreaks "in some of the chir forests of Kumaon," but now there is "a typical widespread epidemic involving heavy loss in the young pine stands in the Kumaon and Garwhal Himalayas."

The attack of this disease, both in plantations and natural forests, is on young trees (seedlings and saplings) up to 20 years of age. "The heaviest infection occurs on young plants 2 to 3 feet high" (Part I.) "Trees beyond 20 years of age appear safe from infection." It is of interest to note that even very young seedlings are susceptible; successful inoculations were made on seedlings between one and two years of age. "Such plants died within one year after inoculation and histological examinations showed the presence of numerous hyphae and haustoria in the cambium and cortical cells." Indeed, death of these plants ensued before there was time for the fungus to form aecia. So far as could be determined "healthy and vigorous regeneration is as much open to such danger as plantation crops," and the disease is not one which is more particularly restricted, as some foresters have maintained, to weak or suppressed plants. The amount of damage suffered in the pine forests of the Kumaon and Garwhal Himalayas has not been statistically estimated, but is considered to be very great. As extreme instances Dr. Bagchee informs us that in one locality examined carefully by him the disease had killed 60 percent of the saplings and of the remaining 40 percent scarcely any were free from infection; in the Almora Forest Division the mortality of young seedlings left wide gaps in the stand, and attempts to fill these by occasional sowings had failed because of the wholesale destruction of seedlings as rapidly as they appeared. "The increase in the rate of mortality as a result of the attack of this bark-inhabiting fungus pest, has threatened to wipe out the pine in the plantations close to Almora." (Part I.)

The lesions caused are stem cankers and are accompanied by little or no swelling. They closely resemble the lesions caused by *Cronartium Comptoniae* on such a pine as *P. Banksiana*. "Under the attack of the parasite the plant dries up and finally dies from the girdling of the stem" (Part I.). The youngest hosts are killed rapidly, but on older ones, according to their age, the cankers persist for from two to many years, spreading from year to year until girdling is completed.

One of the objectives projected by Dr. Bagchee was a determination of the life history of the causal organism. After long, discriminating search a *Cronartium* was discovered on three species of *Swertia* (a genus of the Gentianaceae), annual herbs widely distributed on the forest floors in the affected regions, namely, *S. angustifolia, S. alata* and *S. cordata*. Then followed a series of sound, painstaking experiments, often impeded because of unforeseen technical difficulties, that culminated in ample, positive demonstration of the fact that the blister rust fungus alternates between *Pinus longifolia* and any one of the three species of *Swertia* named. We now have a picture of the life cycle of the blister rust fungus, adequate in its general outlines, and complete in many of its details. The spermogonia emerge in the pine during October or November, not sooner than the year following infection, the incubation period being variably protracted. "The aecidial stage may appear in the following spring or a year later on the same parts of the plant where pycniospores were detected during the previous autumn." A copious crop of aeciospores is produced and they may be wind-borne for very long distances. Infection of *Swertia* takes place immediately, and in from 9 to 15 days after inoculation uredospores are evident. "As in *Cronartium ribicola*, so with this fungus, there is a successive series of uredospore productions which are again followed by a similar series of teleutospore crops. In 1927 when this fungus was first noticed in Kaligadh seven series of uredospore crops were counted. This was succeeded by a mixed crop of both uredo and teleutospores till the end of October. * * * As compared with the uredosori, the teleutosori are produced in relatively greater abundance with each succeeding generation. Up to six distinct waves of teleutospore crops were counted in 1927, and about three crops in 1928." The teliospores germinate promptly *in situ* and the basidiospores are disseminated by air currents, just as is true of the dissemination of aeciospores and uredospores. Exact data on the effective ranges of uredospores and basidiospores have not yet been obtained, but the author arrives at the tentative conclusion that "600 yards for uredospores and 200 yards for sporidia may be taken as the preliminary working distance for control measures." Since the *Swertia* plants die in the fall and neither uredospores nor aeciospores so far as could be determined overwinter in a viable condition the fungus is apparently carried over solely by the perennial mycelium in the cankers on the pines.

Considerable space in the paper under review is given over to a discussion of possible control measures. The author dismisses all

except that of eradication of *Swertia* as being impracticable or of relatively little value. Some observational evidence is adduced in support of these opinions. "Eradication of the alternate host is recommended as the only suitable measure to deal with this disease effectively. * * * A scheme has been suggested for the eradication of *Swertia* spp. for three years in succession and thereafter in alternate years for six eradication years in Periodic Block I areas. The best time for eradication operations is soon after the rains till early autumn, before the *Swertia* seeds mature and are dispersed."

Dr. Bagchee fully describes the causal fungus and chooses to call it *Cronartium himalayense*, sp. nov. "in uniformity with the aecidial stage" which he had previously described under the name *Peridermium himalayense*, a name which he considers particularly appropriate because of the Himalayan native habitat. He reduces to synonomy *Uredo Opheliae* Sydow, a name based on the uredo phase and published with description by H. and P. Sydow in 1903. *Ophelia* is a subgenus of *Swertia*. Based on the claim of greater appropriateness the choice of *C. himalayense* is, of course, not permissible according to international rules of nomenclature. A more valid claim could be advanced because the teliospores are described here for the first time. Many competent mycological taxonomists, however, in their interpretation of the rules, maintain that names based on the uredo phase given prior to names based on the telial phase retain priority. This view is reasonably based. In my judgment, therefore, the correct name of this fungus is **Cronartium Opheliae** (Sydow), n. comb., with synonyms *Aecidium complanatum* Barclay var. *corticola* Barclay (without description), *Uredo Opheliae* Sydow, *Peridermium himalayense* Bagchee and *Cronartium himalayense* Bagchee.—J. H. FAULL.

Wehmeyer's "The Genus Diaporthe Nitschke and its Segregates"—The taxonomic literature of mycology has been piling up apace during the long period of years from Persoon and Fries onward, a constantly mounting mass of descriptions of myriad fungus species. Much of it never satisfactory, the difficulty of using it increases as the unceasing cumulating process continues. This is not a necessary attribute of volume because if the unit constituents are properly depicted and properly named, a directory of Linnean quality to point the way clearly throughout can be formulated. The two outstanding defects are inadequacy of many of the descriptions and interspersion of undetected aliases. The former is referable to scanty material or lack of knowledge of diagnostic characters in phases of life cycles often not